

THE HABITAT, CHARACTER, AND FLORAL STRUCTURE OF
CRYPTANTHEMIS SLATERI RUPP (ORCHIDACEAE).

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(Two Text-figures.)

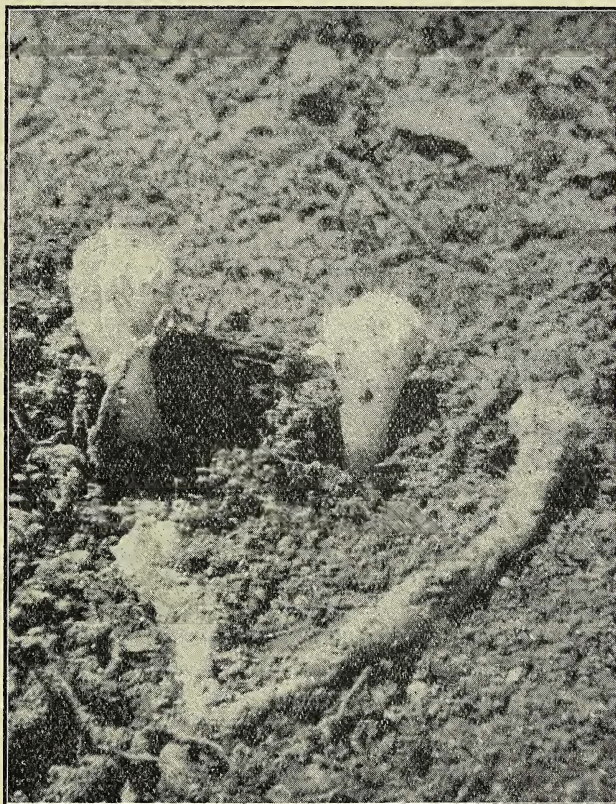
[Read 30th May, 1934.]

I have already described this orchid (These PROCEEDINGS, lvii, Parts 1-2, 1932; and lviii, Parts 3 and 4, 1933) from specimens sent from Bullahdelah, N.S.W., by Mr. E. Slater and Dr. H. Leighton Kesteven. These specimens were more or less fragmentary, and suffered a little damage in transit; moreover, with few exceptions, the flowers were well past maturity and their segments were withered. It was therefore difficult to give a satisfactory account of this strange plant, and many points of interest called for further investigation. A grant from the Australian and New Zealand Association for the Advancement of Science enabled me to pay a visit to Bullahdelah in October, 1933, and the orchid was studied *in situ*. I desire to express here my gratitude to Dr. Kesteven for his kind assistance during this visit; indeed, whatever credit may accrue from the investigations is mainly due to his enthusiastic and generous co-operation.

The site of the discovery of *Cryptanthemis* is a small and obscure water-channel, dry except during rain, when it discharges into a shallow gully a few yards on the south side of the old Alum Company's trolley line near the alum dump—on the lower western slope of the Alum Mountain, and I should say about 250 feet above sea-level. All plants of the orchid hitherto found—in number perhaps 12, but in view of the fragmentary character of the 1931-1932 specimens it is difficult to be sure—have been located within a radius of about eight yards from this spot. Dr. Kesteven pointed out to me, as a fact which may possibly have some bearing upon the occurrence of the plant here, that the surface soil near the old alum dump is almost certainly not the original surface. Years ago, fragments of alunite rock were dumped here by the thousand, and scattered about. A certain amount of soil would doubtless accompany them from higher levels; rain-storms would send down further supplies by erosion, and gradually the original surface would be covered. The ground is very stony, and there is little grass or undergrowth; it is a barren spot occupied chiefly by stringybark eucalypts, under which are carpets of fallen leaves and other debris. The lack of undergrowth serves to make conspicuous the numerous plants of *Dipodium punctatum* R.Br. which are found here. As all the earlier specimens of *Cryptanthemis* were discovered by disturbing the roots of *Dipodium*, it was conjectured that some definite association might exist between the two plants. Dr. J. P. Lindinger, of Hamburg, Germany, has expressed the opinion (*Vict. Nat.*, June, 1933) that *Cryptanthemis* was merely an abortive form of *Dipodium*. Even on the data then available, this hypothesis was untenable by anyone who had examined specimens, but the recent investigation by Dr. Kesteven and myself demonstrated beyond question, not only the validity of *Cryptanthemis Slateri*, but the fact that there

is no real association between it and *Dipodium* at all. Only one of the six plants we "unearthed" was in close proximity to a *Dipodium*.

The first two plants discovered by us had only withered capitula similar to those found in 1931 and 1932. Dr. Kesteven then exposed a white capitulum with all the flowers perfect, and this was found to belong to a plant with four branches, each with a perfect capitulum at its summit. The whole plant was completely subterranean, the top of the highest capitulum being about 2 cm. beneath the surface of the soil. The main rhizome curved slightly, and excavation for a photograph *in situ* was very difficult, as the plant is extremely brittle. One of the four branches broke off before we were ready for the camera, but the remainder of the plant was successfully photographed (Text-fig. A). Three more plants were



Text-fig. A.—*Cryptanthemis Slateri* Rupp.—Plant *in situ*, Bullahdelah, 10/10/1933. Soil excavated on one side. xxx, surface of soil.

found during the morning's search, the total number of capitula being ten, of which five were perfect and five more or less withered. One very small specimen, discovered at some distance from any other, may be a seedling plant.

Dr. Kesteven having suggested that seeds or plants might have been brought to this spot from higher levels in the old alum-mining days, we spent the greater part of an afternoon searching in the neighbourhood of the mine at the top of the

trolley-line, and from there along a zig-zag course down the western slope of the mountain on the north side of the dump. No trace of *Cryptanthemis* was seen, though numerous colonies of *Dipodium* were encountered. We "reconstructed" the largest plant while its form of growth was still clearly remembered; and further photographs were taken. A flower was then dissected and examined under a dissecting microscope. Miss Betsy Kesteven kindly assisted here by making two contour sketches of the labellum and column which were subsequently very useful.

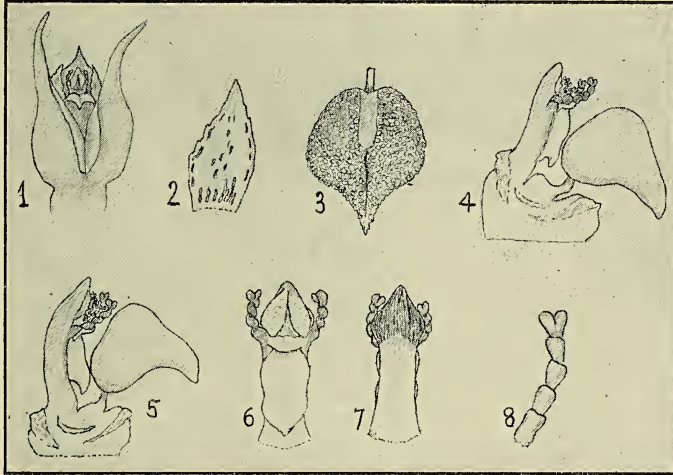
While our investigations had convinced us that the apparent association of *Cryptanthemis* with *Dipodium* in the case of previous specimens could not be deemed to involve any particular relation between the two, since the former was found to occur independently, we considered it likely that the mycorrhiza infesting both might be found to be identical. Dr. McLuckie's investigations of the mycorrhiza of *Cryptanthemis* will doubtless settle this point. If our conjecture is correct, further colonies of *Cryptanthemis* may be discovered by disturbing the soil in the vicinity of *Dipodium* plants, though this method of search was unsuccessful on the occasion just related above. I have already described the character of the ground at the only known habitat of *Cryptanthemis*, and it is of course possible that the plant is restricted to this kind of ground by circumstances not yet revealed: on the other hand, *Dipodium* is well known to occur in various soils of widely differing character.

There can no longer be any doubt that *Cryptanthemis* develops and matures its capitula of flowers beneath the actual surface of the soil. Nevertheless all the withered flower-heads found were just level with the surface underneath the debris of fallen leaves, etc. It would appear, therefore, that as the fertilized ovaries swell and mature, some slight elongation of the flowering branch must take place. One may fairly assume that the purpose of this is to facilitate the dispersion of seed by bringing the fruiting capitula to the surface. As they are still covered by debris, it is difficult to suggest how dispersion is effected except by rainstorms. In spite of the fact that large quantities of seeds are produced and ripened, the apparent scarcity of the plant suggests that successful germination is rare. We found evidence indicating a form of vegetative reproduction: in some instances it was obvious that a branch had been separated from the parent rhizome at the point of junction, and was established independently.

I am unable to record any direct evidence of the method of fertilization, which appears to be very effective. In a plant of so strange a habit, one is naturally disposed to postulate self-fertilization. Nevertheless, it appears to me quite possible that burrowing insects may be the agents. The pollen sacs are extremely fragile, and in many flowers even their remains were so difficult to see that only the discovery of some still intact convinced me of their existence. Pollen was lying loose on the rostellum and on the curving appendages of the column, which appeared to function as preventives of the pollen falling on to the stigma immediately below. I was not able to distinguish the number of pollinia in any of the flowers I dissected. The stigma is large and prominent, with a well-marked basal spur.

In the notes additional to the original description, which were based on the 1932 specimens, I stated that the curious appendages observed near the top of the column were straight, and not curved, as previously described. This is incorrect, and the straightening may have been due to the immersion in water mentioned in the notes. In the fresh flowers recently obtained the normal attitude of the appendages was clearly seen. They arise from the column, one

on either side, at the level of the rostellum, and are curved inward and forward, so that, at least in some of the flowers examined, they form with the rostellum a kind of platform or scaffolding holding the pollinia. Under the microscope each appendage has the appearance of a little chain of single cells, with two cells at the apex (see Text-figs. B, 4-8).



Text-fig. B.—Enlarged details of flower of *Cryptanthemis Slateri* Rupp.—1, A flower from the front. The labellum can be seen between the “flaps” of the large lateral sepals, with the petals flanking it, and behind it is the column protected by the dorsal sepal. 2, A petal, showing indented margins and (red) markings. 3, Labellum flattened out (upper surface). 4, Column and labellum from side, sepals and petals removed. (Outlines drawn by Miss Betsy Kesteven.) Near the top of the column is a remnant of the fractured anther sac. Pollen grains are in front of this, framed by the appendages and rostellum, under which is the large spurred stigma. 5, A similar sketch by the author from another flower. 6, Column from front. 7, Column from rear. 8, One of the column appendages.

The labellum varies in dimensions, but is never relatively as large as that of *Rhizanthella Gardneri* Rogers. It rests on a somewhat elastic-like claw attached to a very prominent projection at the base of the column. It is densely beset with unicellular papillæ, which are elongated at the labellum-margins, giving the appearance of a serrulate edge. Along the basal half of the upper surface is a smooth, shining median plate. The sepals and petals, though more or less overlapping, are quite free. They are thick and succulent in the young flower, but as maturity is reached they tend to become almost membranous. The petals are slightly and very irregularly denticulate, especially on the margin adjoining the dorsal sepal.

The colour of the whole plant, when in normal condition and while the flowers are young, is a waxy white, except where darker patches on the rhizome probably indicate the presence of the mycorrhiza. As the flowers mature, deep red splashes appear on the petals, and suffusions of the same colour become noticeable on the column and the basal half of the labellum. A few days after exposure to the light the whole flower darkens, this change being very

much slower than is recorded by Dr. Rogers to be the case with *Rhizanthella*. Branches are apparently developed by most plants, but here again the habit differs from that of *Rhizanthella*, for some of the branches were developing closely parallel to the parent stem. In the plant photographed *in situ* they were spreading.

Methods of fertilization and germination still await discovery, and it is to be hoped that new colonies of this remarkable orchid will be discovered in the spring of 1934.
